

Remarks

Claims 4, 15-17, 20-24 and 50 have been amended herein. Claims 57-69 have been added. Claims 1-69 remain in the application. Favorable reconsideration is respectfully requested.

Rejections of Claims 1-3, 5-14, 18, 19 and 45-49 Under 35 U.S.C. §103(a) Over Wieland et al. in View of Edlund:

This rejection is respectfully traversed because the Office has not presented a *prima facie* case of obviousness. **The combination** of Wieland et al. and Edlund neither teaches nor fairly suggests the invention positively recited in the rejected claims. Moreover, there is no teaching contained within the applied references themselves to suggest their being combined in the first instance.

The method described in Wieland et al. is limited to the reforming of **methanol** by steam. Applicants' claims, however, positively require reforming of hydrocarbons having at least two carbon atoms, such as ethanol or larger homologs, sugars, and the like. Wieland et al. make no mention of reforming of hydrocarbons having at least two carbon atoms.

Moreover, Wieland et al. actually teach away from using hydrocarbons having at least two carbon atoms. Specifically, Wieland et al. note that the results of their own attempts to reform methanol over an alumina catalyst are surprising because the expected product is diethyl ether. (See Wieland et al., col. 5, line 14-17.) Thus, taking Wieland's surprise at face value, substituting ethanol in the Wieland et al. process would result in additional unknown negative byproducts. Insofar as all the rejected claims positively require reacting water with a hydrocarbon having at least two carbon atoms, there is a fundamental and fatal gap in the teaching of the Wieland et al. reference as applied to these claims.

Combining Wieland et al. with Edlund still does not cure the fundamental failing of the Wieland et al. reference because the **combined** documents still do not teach or suggest reacting water with hydrocarbons having at least two carbon atoms. Specifically, the Edlund reference is also limited to a description of steam reforming of methanol. While Edlund mentions **in passing**

the use of ethanol, this passing reference does not teach (or provide any reasonable likelihood of success) that using ethanol (as mentioned by Edlund) in the reforming process described by Wieland et al. would yield hydrogen. Wieland et al. teach that their results using methanol are surprising because one of skill in the art would expect the process to yield ethers as the primary product, not hydrogen (Wieland et al., col. 5, line 14-17). Using ethanol or larger carbohydrates in the Wieland et al. process would likely result in additional unknown products. The combined references do not address these adverse outcomes. In short, the combination is simply silent on the matter. Therefore, there is no reasonable likelihood of success taught in the combined references.

It is also well-settled law that the Office cannot show a *prima facie* case of obviousness where the proposed combination of two or more references destroys the intended utility of the method described in the primary reference. See, for example, *In re Gordon*, 221 USPQ 1125 (Fed. Cir. 1984). In that instance, there is no technical motivation to make the proposed combination in the first place. In the present rejection, Wieland et al. clearly teach the steam reforming of methanol, while Applicants require the use of hydrocarbons having at least two carbon atoms, such as ethanol or larger homologues, sugars, and the like. The Office proposes replacing the use of methanol, as taught by Wieland et al., with ethanol, as described in Edlund. But Edlund mentions this use of ethanol only in passing and neither of these references teaches the successful reformation of ethanol to yield hydrogen using the Wieland et al. process. And, as note previously, Wieland et al. clearly suggest that hydrogen is not the predicted major product when using Wieland et al.'s alumina catalyst. According to Wieland et al., reacting steam with methanol over alumina should yield ethers. It remains entirely unknown, based on the combined references, whether reacting water with ethanol over alumina would result in the production of hydrogen or other unknown products. Thus, there is a technical disincentive to combine Wieland et al. with Edlund et al. because it remains wholly unknown and unpredictable, based on the combined references, what the process will yield in terms of a product mixtures. The combined references simply do not address this issue. Therefore, this rejection is improper because there is no technical motivation to combine the Wieland et al. reference with Edlund.

Further, this rejection is respectfully traversed because it is not possible for one of skill in the art to extrapolate (with any reasonable probability of success) from the Edlund reference that using ethanol in the Wieland et al. process will yield hydrogen. In support of this proposed result, the Office articulates two reasons: 1) the Edlund reference suggests that methanol and ethanol are equivalent, as are hydrocarbons such as methane and propane; and 2) Wieland et al. teaches the steam reforming of methanol. The Office suggests that it would be obvious to use ethanol in the process of Wieland et al. However, both references teach only the reforming of methanol. Edlund mentions ethanol only in passing and does not indicate in any way that ethanol can successfully be reformed to yield hydrogen at the low temperatures recited in Wieland et al. The likelihood of success of low temperature reformation using ethanol in the Wieland et al. process to yield hydrogen is neither taught nor fairly suggested by the combined references. Therefore, it cannot be considered obvious that reacting water and a hydrocarbon having at least two carbon atoms would result in the successful production of hydrogen. Thus the combined references themselves fail to suggest the desired result proposed by the Office, and positively recited in the claims.

As applied to Claims 18 and 19, the combined references fail entirely to teach how to achieve low temperature hydrogen production using water soluble salts. The combined references fail entirely even to suggest using methods for steam reformation of ethanol for low temperature hydrogen production. If armed only with the Wieland et al. and Edlund references, a person of ordinary skill in the art would not arrive at the present invention because the Wieland et al. and Edlund references completely fail to teach the use of ethanol or other hydrocarbons with two or more carbon atoms.

Applicants therefore submit that the rejection of **Claims 1-3, 5-14, 18, 19 and 45-49** under 35 U.S.C. 103(a) over Wieland et al. in view of Edlund is improper. Withdrawal of the same is respectfully requested.

Objections to Claims 4, 15-17, 20-24 and 50, and New Claims 57-69:

Claims 4, 15-17, 20-24 and 50 have been amended to independent form. New claims 57-69 depend either directly or indirectly from Claim 4, which has previously been indicated as containing allowable subject matter.

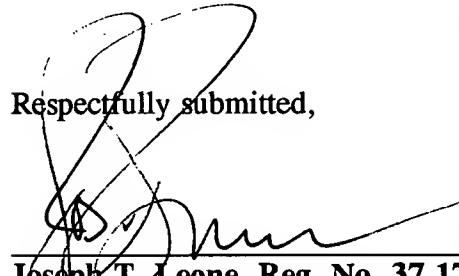
Applicants respectfully submit that these claims are now in condition for allowance.

CONCLUSION

Applicants submit that the objections and rejections have been traversed and that the application is ready for allowance. Early notification of the same is earnestly requested.

Should the Examiner have any questions or comments with respect to the above-referenced application, the Examiner is requested to contact the undersigned attorney. The Commissioner is authorized to charge any fees or credit any overpayments relating to this application to deposit account number 18-2055.

Respectfully submitted,


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